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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,080	07/22/2003	Tsutomu Ogura	03431/LH	9462
1933	7590	09/03/2004	EXAMINER	
FRISHAUF, HOLTZ, GOODMAN & CHICK, PC			BENSON, WALTER	
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NEW YORK, NY 10017-2023			2858	

DATE MAILED: 09/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/625,080

Applicant(s)

OGURA, TSUTOMU

Examiner

Walter Benson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2/02/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

### DETAILED ACTION

1. Claims 1-14 are presented for examination.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4, 7-9, 11, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda (US Patent No. 6,628,501 B2 and Toyoda hereinafter) in view of Shirai. (US Patent No. 6,673,224 B2 and Shirai hereinafter)

4. As to claim 1, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon [col. 1, lines 51-60] substantially as claimed, the improvement comprising:

first and second electrodes being fixed on a surface of the insulating substrate to face each other (col.2, lines 31-33).

Toyoda did not expressly disclose:

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each having a linear thermal expansion coefficient that is less than that of the gas sensitive film and substantially the same as that of the insulating substrate [claim 1];

where the water vapor sensitive film has a linear thermal expansion coefficient equal to or greater than  $2 \times 10^{-5}$  per degree centigrade [claim 3];

the insulating substrate and the first and second electrodes each have a linear thermal expansion coefficient equal to or less than  $1 \times 10^{-5}$  per degree centigrade [claim 3].

Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Toyoda, as evidenced by Shirai.

In an analogous art, Shirai discloses a sensor element disposed within an insulator having:

each having a linear thermal expansion coefficient that is less than that of the gas sensitive film and substantially the same as that of the insulating substrate [claim 1] (col. 6, lines 5-11) to decrease the tensile stress between material boundaries;

where the water vapor sensitive film has a linear thermal expansion coefficient equal to or greater than  $2 \times 10^{-5}$  per degree centigrade [claim 3] (col. 6, lines 39-44) to prevent the formation of cracks in the sensor elements;

the insulating substrate and the first and second electrodes each have a linear thermal expansion coefficient equal to or less than  $1 \times 10^{-5}$  per degree centigrade [claim 3] (col.5, lines 1-4).

Given the teaching of Shirai, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Toyoda by employing the well known or conventional features of sensor technology, such as disclosed by

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Shirai, in order to remove thermal impacts between the different sensor materials and for the purposes discussed above.

5. As to claim 2, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

where the gas sensitive film is a water vapor sensitive film, and the capacitive type sensor has its capacitance varying depending on an amount of water vapor absorbed in the water vapor sensitive film (col. 2, lines 54-56).

6. As to claim 4, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

where the insulating substrate is constituted by a material that is selected from a group consisting of glass, quartz, silicon, ceramics, and sapphire (col. 2, lines 22-25);

the water vapor sensitive film is constituted by a material that is selected from a group consisting of a crosslinked polymer material, and an organic polymer material (col. 3, lines 1-2);

the first and second electrodes are each constituted by a material that is selected from a group consisting of Si, SiC, GaAs, and polysilicon (col. 2, lines 37-51).

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7. As to claims 7, and 11, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, further comprising:

an upper water vapor sensitive film formed on the first and second electrodes and the water vapor sensitive film (col. 2, lines 54-58);

where a shielding film is formed in said upper water vapor sensitive sensor at a location above and near the first and second comb-electrode portions (col. 2, lines 43-44).

8. As to claim 8, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

Where the first and second electrodes are joined to the surface of the insulating substrate (col. 2, lines 22-25).

9. As to claim 9, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

where the first and second electrodes are formed by subjecting an electrically conductive substrate, joined to the insulating substrate, to polishing or etching (col. 4, lines 34-44).

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10. As to claim 13, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

where the first electrode includes a first electrode body, at least one first straight electrode portion extending from the first electrode body, and a plurality of first toothed electrode portions extending perpendicularly from the first straight electrode portion (31, Fig. 1);

the second electrode includes a second electrode body, a plurality of second straight electrode portions extending from the second electrode body, and a plurality of second toothed electrode portions extending perpendicularly from each of the second straight electrode portions (32, Fig. 1);

adjacent ones of the first straight electrode portion, the first toothed electrode portions, the second straight electrode portions, and second toothed electrode portions are disposed to face one another with a predetermined face-to-face distance (Fig. 1; col. 2, lines 30-35);

the water vapor sensitive film is disposed between and in contact with adjacent ones of said first straight electrode portion, the first toothed electrode portions, the second straight electrode portions, and second toothed electrode portions, and cooperates with the adjacent electrode portions to form a plurality of vertically arranged capacitors (col. 2, lines 58-64).

11. As to claim 14, Toyoda discloses a capacitive type sensor having first and second electrodes, a gas sensitive film provided between the electrodes, and an insulating substrate that supports the electrodes and the gas sensitive film thereon, comprising:

where the first electrode includes a first electrode body, and a lower electrode portion extending from the first electrode body and provided with a plurality of first toothed electrode portions disposed at equal intervals (31, Fig. 1);

the first toothed electrode portions extending upward perpendicularly from an upper face of said lower electrode portion, and cooperates with the lower electrode portion to form lower comb electrodes (31, 32, Fig. 1);

the second electrode includes a second electrode body and an upper electrode portion extending from the second electrode body (32, Fig. 1);

the upper electrode portion has an upper wall provided with a plurality of second toothed electrode portions disposed at equal intervals, and side walls fixed at bottom faces thereof to the insulating substrate (col. 4, lines 44-50)

the second toothed electrode portions extend downward perpendicular from the upper wall of the upper electrode portion, and cooperate with the upper electrode portions to form upper comb electrodes (col. 1, lines 54-55);

the upper comb electrodes and the lower comb electrodes are disposed to face one another with a predetermined face-to-face distance (Fig. 1, col. 2, lines 30-35);

the water vapor sensitive film is disposed between and in contact with the upper and lower comb electrodes, and cooperates with the upper and lower comb electrodes to form a plurality of vertically arranged capacitors (col. 2, lines 58-64).



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12. Claims 5, 6, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda in view of Shirai as applied to claim 1 above, and further in view of Toyoda et al. (US Patent No. 6,445,565 B1 and Toyoda (565) hereinafter).

Although the combine teaching of Toyoda and Shirai shows substantial features of the claimed invention (discussed in the paragraphs above), it fails to disclose:

where the first and second electrodes each have a thickness falling within a range from 1 um to 11 um inclusive [claim 5];

where a face-to-face distance between the first and second electrodes falls within a range from 0.5 um to 5 um inclusive [claim 6];

where the first electrode includes a first electrode body and a plurality of first comb-electrode portions extending from the first electrode body [claim 10];

the second electrode includes a second electrode body and a plurality of second comb-electrode portions extending from the second electrode body. the first and second comb-electrode portions are alternately disposed with a predetermined face-to-face distance [claim 10];

the water vapor sensitive film is disposed between and in contact with the first and second comb-electrode portions, and cooperates with the first and second comb-electrode portions to form a plurality of vertically arranged capacitors [claim 10].

Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Toyoda in view of Shirai, as evidenced by Toyoda (565)

In an analogous art, Toyoda (565) discloses a capacitive sensor element disposed within an insulator having:

where the first and second electrodes each have a thickness falling within a range from 1

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um to 11 um inclusive [claim 5] (col. 3, lines 1-5) to reduce the influence of parasitic capacitance output;

where a face-to-face distance between the first and second electrodes falls within a range from 0.5 um to 5 um inclusive [claim 6] (col. 3, lines 5-7) providing maximized capacitance between the electrodes;

where the first electrode includes a first electrode body and a plurality of first comb-electrode portions extending from the first electrode body [claim 10] (col. 2, lines 49-50) for optimizing the spacing between electrodes;

the second electrode includes a second electrode body and a plurality of second comb-electrode portions extending from the second electrode body [claim 10] (Fig. 1; col. 2, lines 49-50) to ensure changes in capacitance for sufficient sensor output

the first and second comb-electrode portions are alternately disposed with a predetermined face-to-face distance [claim 10] (col. 2, lines 50-53) providing for large capacitance changes;

the water vapor sensitive film is disposed between and in contact with the first and second comb-electrode portions, and cooperates with the first and second comb-electrode portions to form a plurality of vertically arranged capacitors [claim 10] (col. 2, lines 60-64). Given the teaching of Toydoa in view of Shirai, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Toyoda in view of Shirai by employing the well known or conventional features of sensor technology, such as disclosed by Toydoa (565), in order to achieve relatively large capacitance changes for a small substrate surface area and for the purposes discussed above.

13. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda in view of Shirai as applied to claim 1 above, and further in view of Takao (JP 61 018850 A., Patent Abstracts of Japan vol. 013, no. 456 (p-945), 16 October 1989 and Takao hereinafter).

Although the combine teaching of Toyoda and Shirai shows substantial features of the Of the claimed invention (discussed in the paragraphs above), it fails to disclose:

where the first electrode includes a first electrode body, a first straight electrode portion extending from said first electrode body, and a plurality of first annular electrode portions extending from said first straight electrode portion;

the second electrode includes a second electrode body, a second straight electrode portion extending from the second electrode body, and a plurality of second annular portions extending from the second straight electrode portion;

the first and second annular electrode portions are alternately disposed with a predetermined face-to-face distance and coaxially with one another;

the water vapor sensitive film is disposed between and in contact with the first and second annular electrode portions, and cooperates with the first and second annular electrode portions to form a plurality of vertically arranged capacitors.

Nonetheless, these features are well known in the art and would have been an obvious modification of the system disclosed by Toyoda in view of Shirai, as evidenced by Takao.

where the first electrode includes a first electrode body, a first straight

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electrode portion extending from said first electrode body, and a plurality of first annular electrode portions extending from said first straight electrode portion (constitution, lines 1-3);

the second electrode includes a second electrode body, a second straight electrode portion extending from the second electrode body, and a plurality of second annular portions extending from the second straight electrode portion (constitution, lines 3-5);

the first and second annular electrode portions are alternately disposed with a predetermined face-to-face distance and coaxially with one another (constitution, lines 6-7);

the water vapor sensitive film is disposed between and in contact with the first and second annular electrode portions, and cooperates with the first and second annular electrode portions to form a plurality of vertically arranged capacitors (constitution, lines 7-8).

Given the teaching of Toydoa in view of Shirai, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Toyoda in view of Shirai by employing the well known or conventional features of sensor technology, such as disclosed by Toydoa (565), in order to achieve relatively large capacitance changes for a small substrate surface area and for the purposes discussed above.

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**Prior Art Made of Record**

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure


A. Hamamoto et al. (US Patent No. 6742,387) discloses a capacitive humidity sensor that includes a pair of opposed electrodes on a substrate.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter Benson whose telephone number is (571) 272-2227. The examiner can normally be reached on Mon to Fri 6:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le can be reached on (571) 272-2233. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Walter Benson  
Patent Examiner

August 31, 2004